CANCER OF THE GASTROINTESTINAL CANAL*

The Bulkley Lecture

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VITAL STATISTICS indicate that next to heart disease cancer is the most common cause of death. Constant vigilance to provide earlier diagnosis and treatment is essential if a larger number of patients are to be saved from an untimely death. One of the chief obstacles in the fight against cancer is the pessimism concerning its curability which is so prevalent among laymen as well as a great many members of the medical profession. A knowledge of actual results which are obtainable by good surgery in reasonably early cases will go far in replacing such pessimism by a healthy optimism. Educational campaigns are essential to disseminate known facts. The American Society for the Control of Cancer has set itself the task of educating the general public in the symptomatology of cancer and urging medical consultation. To educate the doctor in properly evaluating early suggestive symptoms and signs is the duty of medical organizations and institutions. Much is being done in this respect, but in spite of this, patients with untreated cancer continue to present themselves with malignant growths in such an advanced state that the tumor is irremovable and any thought of cure has to be abandoned.

In analyzing the reasons for this one may place patients into one of three groups:

(a) Those in whom the cancer comes on so insidiously that no variation from the normal is noticed until it has reached a stage of growth and dissemination which precludes surgical removal. Such cases will always occur and no amount of education can prevent them.

(b) Patients who present a history strongly suggestive of cancer and who give the examiner the very definite impression that if they had consulted a physician at the first appearance of symptoms, their lives might have been saved. This group may gradually be reduced by cancer campaigns.

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(c) In the third group are included those patients who consulted a physician on the first appearance of symptoms or signs, but in whom the importance of these symptoms was not appreciated. A harmless looking or feeling lump may have been dismissed with the remark "just a little gland, as long as it does not hurt, do not bother about it". A discharge may have been treated with a douche without investigating its source. For symptoms of indigestion prolonged medicinal treatment may have been instituted instead of diagnostic tests. An x-ray examination may not even have been considered. It is this group of cases which is put squarely at the door of the doctor. It is our duty and responsibility to educate ourselves so that this group will become steadily smaller. To do so it is necessary to keep the subject constantly before the medical profession. This has been recognized by many and efforts are being made all over the country to help reduce cancer mortality by properly directed educational campaigns.

The late Dr. L. Duncan Bulkley, a distinguished member of this Academy, and a well-known dermatologist, who was intensely interested in cancer, was one of those who recognized the value of postgraduate education in this branch of medicine. He established the Bulkley Lecture at The New York Academy of Medicine in 1929 for the purpose of annually bringing some phase of this vital subject to the attention of the general practitioner.

We can tell you nothing new nor startling for the knowledge concerning cancer has been built up gradually. Many men have contributed to it until today it is manifest that the application of this knowledge saves many lives which were formerly lost.

Cancer of the gastrointestinal tract is a large subject for one lecture. It is realized that the inclusion of the esophagus, stomach, the entire intestines, especially the colon and rectum, makes it impossible to go into great detail. Nevertheless it was thought advisable to present it in this comprehensive way in order to bring out certain pertinent points concerning symptomatology, laboratory findings and treatment which are common to all parts of the canal.

The chief functions of the gastrointestinal tract are the digestion and absorption of food and the elimination of the non-used waste products. An important associated function therefore must be the regular propulsion of its contents through the canal. Any interference with this mechanism leads to disturbances which manifest themselves as

symptoms. These disturbances in turn may initiate other symptoms or physical signs. Carcinoma tends to narrow the lumen of the alimentary canal wherever it happens to develop. This produces interference with the propulsive mechanism, hence symptoms due to some degree of disturbance of the mechanical function are the most likely. This in turn leads to interference with normal secretion, absorption and elimination and initiates a symptom complex of nutritional disturbance which produces weakness and loss of weight.

The entire gastrointestinal canal is about twenty-five to thirty feet in length, of which only nine to ten inches form the esophagus and a similar length the stomach. Of the remainder, four-fifths form the small intestines and one-fifth the colon and rectum.

The lumen of the canal varies a great deal in size and it appears that cancer is most common where it is narrow and offers opportunity for stagnation and irritation. The rarity of cancer of the small intestines is explained on the theory that its fluid contents flow along a fairly uniform lumen without obstruction and irritation. This theory accords with our present day conception of the etiology of cancer, which seems to point to chronic irritation in a susceptible individual as the most likely cause. In all locations of the gastrointestinal tract in which cancer is commonly encountered such factors can usually be adduced.

In the esophagus coarse and poorly masticated food, very hot or other irritating food, may produce cell changes at the physiological narrowings. In the stomach improperly masticated food, changes in secretory activity with spasm, retention and irritation may well play a role. In the colon stagnation with formation of toxins and secondary irritation offer a fertile field for the development of cancer.

Figures concerning the incidence of cancer vary a great deal, depending on the source, whether from clinical medical, surgical or autopsy material. According to the vital statistics of New York City for 1936, cancer of the esophagus constitutes about 3.1 per cent of all cancers, cancer of the stomach 17.2 per cent, cancer of the small intestines 0.2 per cent, cancer of the colon and sigmoid 12.7 per cent and cancer of the rectum and rectosigmoid 7.2 per cent.

The proportion to all cancers of the gastrointestinal tract is about: 6.1 per cent in the esophagus; 33.8 per cent in the stomach; 0.4 per cent in the small intestines; 25.1 per cent in the colon and sigmoid; 14.2 per cent in the rectum and rectosigmoid.

Except in the esophagus and in the anal canal, which are lined with squamous epithelium and usually give rise to epithelioma or epidermoid carcinoma, all cancers of the gastrointestinal canal are adeno-carcinomas. They arise from the columnar epithelium lining the entire tract. Though they have the same origin, there is considerable difference in the gross as well as in the microscopic appearance of these tumors. Some are small, somewhat pedunculated or polypoid, project into the lumen and do not early penetrate into the wall. Others form flat serpiginous ulcers with overhanging edges and have a great tendency to penetrate the gut wall. Still others form large bulky masses or very small scirrhus tumors. Gelatinous or mucoid degeneration may take place and still further complicate the picture. An explanation for this behavior is to be found in the normal difference of cells in the various sections of the alimentary canal, in the virulence of the cancer cells, as well as in the reaction of the host to the invasion of malignant cells.

The difference in development of cancers of the gastrointestinal tract explains some of the differences in their clinical manifestations as well as in their course and prognosis. It is known that the papillary types of tumor which project into the lumen offer a more favorable prognosis than those invading the wall and involving the peritoneal coats, and they are of a lower grade of malignancy. However it is not only the lower grade of malignancy which makes them more favorable, but the fact that they may give rise to bleeding, or if favorably situated, produce intestinal obstruction and thus become recognized before invasion of lymph nodes has taken place. The small scirrhus cancers on the other hand are frequently not recognized until very late. They give rise to no bleeding and the increasing constipation receives scant attention except an increase in the dose of a laxative until acute intestinal obstruction supervenes. Then again large massive tumors may give rise to bleeding or obstruction and in addition to that they may be palpable.

The early symptoms produced by a malignant growth are unfortunately so vague that they are difficult to recognize. If allowed to go untreated, the outstanding symptom common to nearly all cancers of the gastrointestinal tract is obstruction; but as we have just explained, this symptom may appear early or late. Thus a growth developing at a narrow portion of the canal, and projecting into the lumen may produce a mechanical obstruction and lead to recognition early. A similar growth developing in a wide portion of the canal may grow to a large size,

perhaps never lead to obstruction and become recognized chiefly because of its bulk, or because of bleeding, or breaking down with resulting toxemia or anemia.

It is usually some degree of obstruction, vague though it be, which first attracts the patient's attention. Whether this obstruction is in the esophagus, the stomach, or the intestines, spasm is immediately added to the mechanical factor, and congestion with more or less stagnation results. Added to this are secretory changes, disturbed digestion and a whole train of symptoms depending on the location and extent of the lesion.

The diagnosis of early lesions depends to a large degree on the alertness and experience of the examining physician. Does he on the basis of symptoms presented suspect carcinoma? It cannot be stressed too often how important it is not to overlook what appear to be vague or unimportant symptoms such as loss of appetite, indigestion or any change in the bowel habit.

Changes in function due to some narrowing of the lumen are the most important. They may not approach actual obstruction but be sufficiently marked to temporarily delay the passage of food or intestinal contents. Depending on the location one may have discomfort or difficulty with swallowing, fullness in the stomach associated with belching, nausea and occasionally vomiting, anemia due to bleeding, absorption of retained material or products of the tumor, possibly constipation and diarrhea alternating, or difficulty with gas.

Many of these lesions being ulcerative, there may be blood, either in the vomitus or in or on the feces. It may be in small quantity detected only by chemical tests, or it may appear grossly. Chemical tests, especially gastric analysis may be helpful in determining altered secretion, products of stagnation, or blood.

At times one may be able to feel a mass, either in the stomach, colon, or rectum. The presence of a palpable tumor does not mean that it is not removable and should never act as a deterrent to operation.

One may bring a lesion into view with the aid of an esophagoscope, gastroscope or proctoscope.

By far the greatest aid in the detection of lesions of the gastrointestinal tract are roentgen examinations. This is true particularly of those cancers which are inaccessible to palpation or instrumental examination. If done with the proper technique the percentage of error is

slight. Most roentgenologists have developed methods of examination which in their hands rarely fail to demonstrate an existing defect. It has seemed to us that the greatest justification for criticism of procedure in the diagnosis of cancer of the gastrointestinal tract lies in the fact that roentgen examination is not resorted to sufficiently often. With only slight symptoms, even though suggestive, a physician hesitates to subject a patient to the expense involved, and as a result the lesion progresses from a curable one to one less favorable. The important thing to bear in mind and to teach, is to have x-ray examinations made at the first sign of trouble and not to wait until the patient presents a typical picture of advanced disease. To make such examinations more easily possible for everybody may well be the goal of all those interested in Public Health. Any or all of these examinations may be initiated after a good history and physical examination have made one suspect the presence of cancer. One should not rest until the lesion has been found or definitely ruled out. In case that is not possible, careful observation and re-examination at a later date are indicated.

Treatment consists of *destruction* or *removal* of the growth. Destruction is applicable only in readily accessible tumors, and may be carried out by means of radium, Roentgen rays, actual cautery or surgical diathermy. In spite of the fact that some tumors are radiosensitive, radiation therapy has so far not attained the results which had been hoped for. At the present time surgical removal offers the best chance for cure. Only in very favorable cases may one at times carry out local removal with a satisfactory result. Usually radical resection of the tumor with sufficient normal tissue surrounding it, and a portion of gut above and below the lesion, and including the lymphatic drainage area, is the operation of choice.

Cancer of the Esophagus

Owing to the deep situation of the esophagus, and its inaccessibility to ordinary vision or palpation, the older methods of examination were limited, and treatment likewise restricted. Following the advent of the Roentgen rays and the esophagoscope, exact diagnostic methods have been developed, and the successful treatment of carcinoma has advanced considerably.

Cancer of the esophagus may occur at any level, but has certain sites of election which correspond with the physiological narrowings.

The onset is insidious and for this reason medical aid is rarely sought until dysphagia has become manifest. Even then, this symptom is often not given the necessary attention and the disease is allowed to progress until regurgitation of food, salivation, pain and loss of weight occur. All of these symptoms are late manifestations and explain, in part at least, why surgery for cancer of the esophagus has not made more progress.

The chief obstacle to early diagnosis is the vagueness of symptoms. One has to be mentally alert when a patient with slight difficulty during the act of deglutition presents himself. Suspecting a lesion and referring the patient to a competent roentgenologist and endoscopist momentarily ends the physician's responsibility at this point. It is better than to resort to bouginage with its attendant dangers of irritation and possibly perforation. In experienced hands the diagnosis is usually made easily by means of roentgenograms, which in a typical case show an irregular deformity with slight dilatation above it. This should be supplemented by an esophagoscopy and biopsy because errors in diagnosis are possible.

With a definitely established diagnosis the question arises as to what should be done for the patient. It is the aim of treatment to cure the disease, and if that is not possible, to relieve symptoms and prolong life. Radical operation, x-ray and radium treatment, surgical diathermy, bouginage and palliative gastrostomy may be considered. Which course to follow depends on the patient's general condition, as well as on the state of the local disease.

Palliative treatment is used in those patients who refuse radical operation or in whom the disease has progressed beyond the operable stage. Under palliative treatment the following measures may be adopted as indicated:

1. *General Medical Care.* In early cases when swallowing is still possible, a well balanced diet should be arranged, with all food finely divided to prevent stagnation. Attention must be given the heart and kidneys, and bowel elimination aided. Adequate rest is of importance to preserve the patient's strength. In all advanced cases the most important consideration is the administration of adequate quantities of fluids to overcome dehydration and toxemia. One may resort to hypodermoclysis, proctoclysis, or venoclysis. The addition of 5 per cent glucose to any of these is helpful. Whether to tell the patient of the nature of his illness has to be judged in the individual case. Inasmuch as most patients

with this lesion are men, it is frequently advantageous to do so in order to gain their cooperation and to enable them to arrange their affairs. If one has the impression that such knowledge will lead to severe mental depression it may be better to withhold the information.

2. *Gastrostomy*. This should not be reserved as a last resort, but be performed in most cases soon after a diagnosis has been made. Though it is a relatively simple operation which may be done under local anesthesia with a low mortality in patients in fairly good general condition, it is much more dangerous in an emaciated dehydrated individual with poor healing power. Patients frequently object to such an operation because of the annoyance of constantly wearing a tube, and the necessity of having all food administered in that way. To overcome these objections, a Janeway gastrostomy is recommended which does not require the use of a tube except at meal time and which usually does not leak. After it has been in use a short time, and the esophagus has been put at rest, the swelling due to irritation associated with the carcinoma may subside and the patient be able to swallow better than before. In all complete obstructions gastrostomy is a temporary life-saving measure.

3. *Dilatation*. In some clinics this method is used in preference to others. If carefully performed by passing bougies over a previously swallowed silk thread or under guidance of the eye through an esophagoscope, there is probably not much risk connected with it in trained hands. Unless one is an expert, however, perforation with a fatal outcome may result. It gives temporary relief only.

4. *Intubation*. After a carcinomatous stricture is dilated, it is at times possible to insert a tube, which maintains the lumen permanently. These tubes vary in size and are made of rubber or metal. Their introduction requires skillful manipulation and should be attempted only by experts.

5. *Radiation Therapy*. Although classed with the palliative measures it is really intended to be more than that. One's aim is to destroy the tumor either by means of deep roentgen therapy or by the insertion of radium capsules or radon seeds. Unfortunately, such happy results have not been attained so far, but with the modern treatment developed at some clinics, considerable relief and probably prolongation of life may be looked for. Radiation therapy may, of course, advantageously be employed in combination with dilatation, establishment of a gastrostomy or other treatment.

6. *Electrocoagulation.* In selected cases, especially those with an elevated polypoid type of tumor, destruction of the growth may at times be accomplished. One has to be very careful to select only such cases in which the growth is small and superficial, because the destructive action of the coagulation may easily lead to perforation.

Only a small group of carefully selected cases may be considered for radical operation because of the fact that a patient usually has a well advanced carcinoma when he comes under a surgeon's care and because of our present state of knowledge. Because the operation is always a formidable one, the patient should be in fair general condition and one whose symptoms and findings suggest that the lesion is in its early stages.

The surgical approach varies depending on the location of the tumor. The technical problems involved are quite varied and it is therefore best to consider the treatment under the headings of (a) carcinoma of the cervical portion, (b) carcinoma of the thoracic portion, (c) carcinoma of the lower esophagus and the cardia.

Cancer of the upper end of the esophagus is removed from above. At times the larynx and pharynx must be sacrificed because the growth has a tendency to spread into the hypopharynx. For the resulting defect a reconstruction operation may be considered later. A gastrostomy is usually advisable.

Removal of a carcinoma affecting the middle or thoracic portion of the esophagus is technically the most difficult and dangerous. Reports of successful extirpation are increasing in the literature. Ingenious methods of approach have been developed. The best known one, and the one having the largest number of successful results to its credit is the one developed by Torek. It consists of a preliminary gastrostomy, followed by a transpleural resection of the affected esophagus. The upper end is brought out at the neck and is later connected with the gastrostomy by means of a rubber esophagus. In suitable cases a reconstruction of the esophagus may be carried out. The method has lately been modified by dividing the main operation into two stages. Perhaps at the time the gastrostomy is performed, or as an independent procedure, the upper end of the esophagus is brought out at the neck through an incision along the anterior border of the sternocleidomastoid. The tumor is then removed at a later date through the thorax.

Recently there has come a report from England and another from

Germany of the successful extirpation of a carcinomatous esophagus by blunt dissection with the aid of the hands passed through a high epigastric and a neck incision along the entire mediastinum without opening the chest. The lower end is divided, the stumps closed and the entire esophagus drawn out at the neck and removed. Extrapleural resection through the posterior mediastinum has also been successfully performed.

Cancer of the lower end of the esophagus may be removed through the chest or the abdomen. The ideal operation is to reimplant the stump of the esophagus into the fundus of the stomach in order to permit normal deglutition. A gastrostomy is usually not required.

Cancer of the Stomach

According to available statistics, cancer of the stomach is responsible for at least one-third of all male and one-fifth of all female cancer deaths.

The general attitude of the profession regarding carcinoma of the stomach is one of resignation, and is no doubt based on the observation that the majority of patients come under surgical care at a time when resection of the stomach, which offers the only chance of cure, is precluded by the extent of the disease. Even a palliative operation is possible in only a comparatively small group of cases.

With the refinements in diagnosis, with better preoperative and postoperative care, and with meticulous surgery, there has been considerable improvement. Recent statistics by well-known surgeons and clinics offer a distinct note of hopefulness, which encourages one in the belief that general improvement in results may be expected. It should therefore be our aim to have patients with vague gastric symptoms referred early to a physician; to have the physician employ all his resources in making an early diagnosis, and then to have the patient promptly operated on. Even when this has been accomplished, however, a large percentage of patients will still come under observation at a time when the disease has progressed beyond the operable stage. This is due to the fact that cancer of the stomach is frequently so insidious in its onset, and the symptoms so slight that the stomach is not even suspected of being the seat of disease. In the beginning there is often no more than slight deviation from normal health. There may be just a feeling of lassitude, slight loss of appetite and lack of interest. Not until diminution of appetite and a little indigestion appear is there any suggestion

that the stomach may be at fault. As the disease progresses, loss of appetite or a distinct aversion to food, especially meat, becomes more marked; there may be definite discomfort after eating, nausea, belching or eructation. Associated with this may be anemia, loss of weight and occasional vomiting. Inasmuch as indigestion is common in middle life, which may be due to a variety of causes, and is often transitory in character, the patient does not seek medical advice until persistence or severity of symptoms compels him. For the same reasons the physician frequently does not realize the serious implications of comparatively slight symptoms. Instead of subjecting the patient to diagnostic methods which would lead to early recognition of the underlying cause, he is apt to try unduly prolonged medicinal treatment for the relief of symptoms. If we were not dealing with cancer, such a course would not be serious; but the cancer grows steadily while we procrastinate, valuable time is lost and the condition may progress from an operable to a less favorable one. There is no retracing our steps when we have missed an early diagnosis. The battle against cancer of the stomach demands that we think of it whenever a patient presents himself with slight indigestion or aggravation of an old existing indigestion. Thinking of it and feeling the necessity to prove its presence or to rule it out is the only safe guide.

Physical examination is usually negative at the beginning of the disease unless a favorably situated tumor at the pylorus causes early obstruction. In such a case a palpable tumor or a peristaltic wave passing from left to right across the epigastrium point to pyloric obstruction. Usually such findings are an indication of more advanced, but often still operable, disease.

Diagnostic measures which may be employed include a test meal. Many physicians seem to have no faith in its value, but it should still be considered as important supplementary evidence. With its aid one may determine retention and stagnation, changes in acidity and the presence or absence of blood. The significance of all these findings has to be carefully weighed. Retention means obstruction of some kind and requires further investigation. If mechanical in character, cancer is a possibility especially if associated with absence of free hydrochloric acid, the presence of lactic acid and Boas-Oppler bacilli. On the other hand such findings are not pathognomonic of cancer. Normal acidity is not incompatible with the presence of a malignant growth. The presence of blood, likewise is merely an indication of an ulcerative lesion, but not necessarily

cancer. However, given a patient in the cancer age with characteristic symptoms and abnormal gastric findings, the probability of cancer must not be overlooked.

The most important diagnostic aid is a roentgen examination for evidence of a defect, rigidity of the wall, absence of peristalsis, and retention. The technique in experienced hands has developed to such a degree that a positive diagnosis can be made in the great majority of cases. There is no possible excuse for not having an x-ray examination of the stomach made in every patient with vague epigastric symptoms, except perhaps the cost involved. There is no doubt that many more examinations would be made were it not for the financial aspect of it. In the eyes of patients, expenditures like that are always justified with a positive finding; with a negative finding, however, a physician may be called an alarmist and the expense involved is charged against him. Even the affluent often hesitate at the cost of an x-ray examination unless symptoms are severe. Clinic patients of course have all the examinations made which are indicated. The people with small incomes in the great middle class find the cost of a gastrointestinal series beyond their resources. It is therefore frequently dispensed with, though indicated, in the hope that the symptoms may disappear. This point deserves stressing again and again.

If all attempts at diagnosis fail, and suspicion of malignancy persists, an exploratory operation should be considered. It should not be undertaken too lightly, but indications are that it might advantageously be resorted to more often than is the case.

Nothing very positive is known concerning the etiology. In most cases symptoms come on insidiously without any previous gastric disturbance. One is therefore compelled to admit that cancer is probably cancer right in the very beginning in the majority of cases and is not grafted upon a pre-existing disease. On the other hand, it may well develop in the changed mucosa of an old gastritis. The frequent finding of gastritis in connection with cancer lends credence to this theory. If we assume chronic irritation to be the starting point in other parts of the body, the stagnation and irritation due to pylorospasm in association with gastritis may well be an etiological factor. Another possibility is cancerous degeneration of an adenomatous polyp.

The question of the relationship of gastric ulcer and carcinoma is

very interesting and has aroused a great deal of discussion. Some clinics have reported a very high incidence, but the majority of conservative surgeons report between 10 and 20 per cent. There seems little doubt that a certain number of cancers develop on the basis of an old ulcer. In those cases in which ulcer symptoms long preceded the cancer, one may definitely have to assume this etiology. On the other hand the findings of an ulcer with carcinoma does not necessarily mean that the carcinoma has developed on an ulcer basis. Quite the contrary, a carcinoma may ulcerate and sometimes to such a degree as to destroy most of the cancer cells. The question has not yet been solved satisfactorily.

With the present state of our knowledge the treatment of cancer of the stomach is surgical. Experience so far has shown that x-ray treatment is helpful in alleviating symptoms in a small percentage of cases, but it is not curative. Surgery is strongly indicated and is life-saving in many early cases. Surgery is also indicated in more advanced cases; as a matter of fact an exploration should be done in all patients whose general condition warrants it. Though many will be found to be too far advanced, not infrequently one finds conditions more favorable than had been anticipated, and a resection may still be possible. In others a palliative procedure may be done, either a gastroenterostomy alone or combined with exclusion of the pyloric end containing the tumor.

A palpable tumor, even a large one, is no contraindication to operation; it may be found to be readily removable. Any tumor which is removable, is operable. One should not be frightened by the presence of enlarged lymph nodes, but remove them with the specimen. Enlarged lymph nodes do not necessarily mean involvement. They may be inflammatory in character due to absorption from an ulcerating carcinoma.

In a planned operation for cancer of the stomach, which is not an emergency, ample time is available to prepare the patient properly for the procedure. This is one of the most important steps in the handling of the patient, and in connection with improved surgical technique is responsible for the lowered mortality at the present time. Under preoperative treatment may be mentioned attention to the heart, kidneys and lungs in order to build up the patient's resistance. The most important steps, however are the administration of sufficient quantities of fluids by venoclysis or hypodermoclysis to overcome dehydration and toxemia; daily gastric lavage to remove stagnated contents, overcome edema and prevent absorption; oral administration of nutritious fluids which may

still pass through the pylorus; and transfusions to raise the lowered vitality.

Thus prepared, the patient is a far better risk and the surgeon may perform a radical operation which otherwise would seem too hazardous. The operability for cancer of the stomach has been definitely extended by the application of effective preoperative care, so that from 40 to 45 per cent are now operable whereas some years ago, operation was advisable in less than 25 per cent.

The ideal operation consists of the removal of the tumor with a safe margin of normal tissue above and below the lesion and the removal also of the regional lymph nodes along the lesser and greater curvature. Just which technical procedure is used is a matter of the personal preference of each surgeon. The Billroth II method is the one most frequently employed in cancer because of certain advantages over others. Inasmuch as both ends, the duodenum as well as the proximal stomach, are permanently closed, one may make use of the von Petz sewing machine, which is time saving and effectively closes off the ends of the specimen and thereby prevents soiling. It has the further advantage that the gastroenterostomy is placed higher up on the stomach stump which would more certainly provide an open stoma even if a local recurrence should develop.

The postoperative mortality is influenced by many factors. It is no doubt higher with a high operability because if a surgeon takes a chance to extend the benefits of a radical resection to those who would be rejected by others, some increase in mortality rate may be looked for. However in the hands of good surgeons the increased risk may be compensated for by the greater skill. About 20 per cent is perhaps as low as may be expected with a high degree of operability.

The final results are the index of the value of radical operation. Considering untreated carcinoma of the stomach a rapidly fatal disease, it is gratifying to know that with an operability of 40 to 45 per cent a five year result of 30 per cent or more may be looked for. The following table published by Balfour is an indication of the progress which has been made.

Our own results, though covering only a small series of cases, correspond rather closely to those of Balfour. We have extended operability to include very difficult cases which would probably have been rejected by many surgeons for a radical procedure. From the results one may gain some encouragement in continuing the fight. Improvement is to be looked

TABLE I

Operative Experience in Carcinomata of the Stomach (Balfour)

Procedure	*Number of Cases*	*Percentage*
Resections	2,112	45%
Gastroenterostomy	815	17%
Exploration	1,866	38%
Total	4,793	100%
Five Year Results		
With lymph node involvement		18%
Without lymph node involvement		48%

TABLE II

Operative Experience in Carcinomata of the Stomach (Eggers)

	Number	*Percentage*
Total Number of Cases	63	100 %
Resections	28	44.4%
Postoperative mortality	5	17.9%
Total resections of five years' standing	18	
Lymph node involvement present in	12	
Survivors in five-year-resection series	6	
Five-year survivors in which lymph node involvement was present	1	

for in earlier diagnosis, proper preoperative care of the patient, and good surgery.

CANCER OF THE COLON

Under this heading are presented malignancies of the cecum, ascending, transverse and descending colon, as well as those of the sigmoid. The reason they are classed in a group by themselves, in distinction from those of the rectum and rectosigmoid, is that there is a marked difference in the therapeutic problems involved. In the former group it is usually possible after resection of the affected portion to reestablish continuity of the gut with subsequent normal bowel function. In the latter group on the other hand a permanent artificial anus is the usual price the patient has to pay for a cure or attempted cure.

Cancer is much more common on the left than on the right side of the colon, the proportion being about two to one. The most common site is the sigmoid. It is well known that cancer has a tendency to develop where anatomically the gut is the narrowest. Surgeons and pathologists have speculated on the underlying reasons for this and it seems probable that the difference in the lumen with the added opportunity for stagnation and irritation play a rôle. Added to this one may consider

that the more solid constituents of the colon on the left side and the great accumulation of toxic products are factors. Of late years the frequent occurrence of polypi of the sigmoid and rectum with malignant degeneration has attracted considerable attention. Experience has further shown that usually tumors of the right side of the colon are less dangerous than those of the left, with respect to infection, as well as to the tendency to metastatic invasion of lymph nodes and the liver. It is interesting to observe that pathologically there is frequently quite a difference in the type of tumor encountered. On the right side they are usually flat, or ulcer like, or large bulky masses; while sigmoid tumors are frequently small scirrhus growths which encircle the gut.

These various considerations to a large degree explain the difference in symptomatology, and provide a reasonable explanation for the fact that most patients come under observation only many months after the first manifestation of symptoms. A tumor developing in the large cecum for instance, does not interfere with bowel function, it does not bleed until it ulcerates and it may not produce a palpable tumor. It therefore escapes attention until a massive tumor either becomes palpable and begins to obstruct the flow of intestinal contents, or by ulceration and absorption of breaking down tumor tissue, produces toxemia, bleeding and anemia. A similar tumor at a narrow portion of gut, such as the hepatic or splenic flexure may produce narrowing of the lumen early and thereby lead to recognition. In the sigmoid on the other hand, an encircling scirrhus tumor which grows slowly, may not lead to striking symptoms until actual obstruction suddenly appears. The symptomatology depends chiefly on the interference with the flow of intestinal contents. Obstruction at some time in the course of the disease is the chief symptom. It is usually chronic, but not infrequently acute obstruction supervenes, especially in the sigmoid. In any middle aged or elderly person with obstruction, if strangulated hernia or bands of adhesions can be ruled out, carcinoma of the colon is the most rational diagnosis.

The obstruction is usually slow and progressive which permits the gut to accommodate itself to the changed condition by hypertrophy of the bowel wall and by rendering fluid the intestinal contents above the obstruction in order to permit passage through the narrowed portion. The resulting changes in bowel habit, consisting of either increasing constipation, or attacks of diarrhea, or alternation of these symptoms, may early draw attention to the real underlying cause. If a temporary

acute obstruction supervenes which so frequently happens when a hard particle of feces or a foreign body becomes lodged in the stenosed gut, investigation is urgently called for. While these changes gradually take place in the gut, the general health suffers due to dehydration and toxemia, and a progressive loss of weight and strength results. At times there is marked anemia especially with the large bulky tumors. Ulceration usually takes place in the tumor with consequent toxic absorption and bleeding. Examination of the feces therefore frequently results in the finding of blood. It may be occult if coming from a lesion higher up in the colon, or bright red, accompanying defecation or clinging to the fecal masses, if arising from a tumor situated in the lower colon.

Patients not infrequently complain of pain, usually cramp-like in character and associated with the retention of gas. They often feel gas "stick" in a certain place and possibly always in the same place, which is a symptom requiring investigation. They may feel and hear gurgling in the intestines and have general discomfort. At times they have explosive movements. All of these symptoms are important if appearing in a patient who has formerly not suffered in this way, and they call for investigation. On examination one may find nothing abnormal, especially not if the abdomen is distended. Many elderly people habitually have a distended abdomen and in that case it is of no value as a diagnostic sign. However, if it has appeared but recently this distention in itself may be an important sign. One may be able to elicit tenderness, particularly over a distended loop proximal to a growth, and one may be fortunate enough to detect peristalsis. This, however, is usually present only in an advanced case with threatening obstruction. At times a tumor mass is palpable. The examiner may discover this accidentally during a routine manual examination or his attention may be drawn to it by local symptoms. Tumors of the cecum, sigmoid and other parts of the colon may thus be palpated but those of the hepatic and splenic flexures are frequently hidden.

Most important in the diagnosis is an x-ray. Experience has shown that a barium meal when it hardens in the intestines is liable to block a stenosed lumen of gut and thereby precipitate an acute obstruction. Physicians have therefore largely abandoned this method of examination as a routine in all suspected malignancies of the colon, and are resorting to a barium clysma instead. It is safer; the findings are known more promptly and the results of examination are generally more satis-

factory. With proper preparation of the colon in a suspected case the demonstration of a defect in the lumen is usually not difficult. However, overlapping of a tumor by a loop of gut filled with barium has frequently led to errors in diagnosis, especially so with a redundant sigmoid. In order to avoid such errors roentgenologists have developed a special technique for colon lesions. A prerequisite is a clean colon, best obtained with the aid of an enema or irrigation. The contrast mixture is then allowed to run in slowly under guidance of the fluoroscopic screen. Abnormalities are noted and plates are then made in different positions. One of the most important is the oblique which permits unfolding of the entire sigmoid with the aid of a certain amount of pressure. After defecation additional plates should be made. Lately a special technique which makes a study of the mucosal pattern possible, has been added to the diagnostic resources of the roentgenologist. In cases of acute obstruction also, the x-ray has a certain value. An ordinary flat plate may show distended loops of gut containing air, or there may be fluid levels in the lumen. A carefully administered barium clysma may show the site of obstruction and thereby aid in the selection of the indicated operative procedure.

The treatment depends on the location of the lesion, as well as on the state of the disease. In acute obstruction one has different problems to consider than in chronic incomplete obstruction or in early cases. The immediate indication in acute conditions is relief of the obstruction, usually by means of a cecostomy or a colostomy. A preliminary x-ray may help in choosing the proper site for the incision. The question of coping with the tumor comes up for consideration after the acute symptoms have subsided.

In all early cases and in those with chronic incomplete obstruction a planned operative procedure is possible. This should be preceded by a period of preparation to allow local inflammatory conditions to subside and to build up the general resistance of the patient. Especially if there have been attacks of obstruction the gut wall is edematous and infiltrated and there may be a certain amount of pericolonic inflammation. Daily enemas or laxatives, combined with bed rest, will help to restore tissues to a condition which permits handling with less danger of spreading infection. If it cannot be accomplished in this way a preliminary cecostomy or colostomy is indicated. In the meantime measures are undertaken to increase the patient's general resistance. This is done by

the administration of nutritious fluids by mouth, or by venoclysis and hypodermoclysis. Transfusions are of great value and should be resorted to freely.

The operative procedure itself varies with the location of the tumor. In lesions affecting the ileocecal junction, the cecum, ascending colon and hepatic flexure, a resection of the right side of the colon with subsequent ileocolostomy is the operation of choice. In suitable cases the entire procedure may be carried out in one stage. In case the patient's general condition is not favorable, or if there have been obstructive signs, it is best to divide the operation into two stages. The first step consists of doing an ileocolostomy by uniting the distal end of the ileum with the transverse colon. It usually results in prompt improvement in the patient's condition which will permit the second stage to be performed after a few weeks. The abdomen is opened through the same incision and the entire right colon with the stump of the ileum and all lymph nodes, removed in one mass.

Tumors of the transverse colon, the splenic flexure or the descending colon are best handled by resection and subsequent end to end or lateral anastomosis. It may be done in one or two stages as indicated. A certain amount of mobilization of the gut is usually required to permit suture without tension.

The most important tumors of the colon, from the standpoint of frequency, therapeutic problems involved, and danger, are those of the sigmoid. Unfortunately a large percentage of patients with carcinoma of the sigmoid are admitted with symptoms of acute obstruction, while others are so far advanced that complete removal is not possible. The most ideal are naturally those without lymph node involvement. Prognosis in those patients is very good, though sometimes there are early metastases to the liver.

The Mickulicz operation is commonly employed. It is efficient when no nodes are involved and the sigmoid is long and has a wide mobile mesentery, so that one may simply bring out a loop of gut with the tumor without interfering with its blood supply. However, if the tumor is large and fixed, the mesentery short and lymph nodes involved, the operation has serious shortcomings. If one attempts to get beyond the nodes at the first stage, one may interfere with the blood supply and cause gangrene beyond the exteriorized loop, resulting in leakage and peritonitis. It has the additional disadvantage in such cases of making it

practically impossible at the second stage to get beyond the nodes because of matting together of the tissues. One, therefore, may have to be satisfied with an incomplete operation. For these reasons different methods of procedure have been advised. One may at times perform a primary resection, and in our hands this has given very good results in properly selected cases. In other cases one may effect either a cecostomy or a colostomy proximal to the tumor for decompression of the bowel, and later follow with a resection of the tumor and anastomosis of the gut. Rankin is a strong advocate of what he calls obstructive resection of the gut, after preliminary decompression.

Whatever method one chooses, it is important to resect the tumor together with the lymph nodes draining the affected portion of gut. It is a safe procedure after edema and infection have been overcome by draining and irrigating the bowel. Rankin with his extensive experience has some very illuminating statistics concerning five year results. He further demonstrates that the intrinsic activity of the cancer cell as measured by Broder's classification of malignancy plays an important rôle in these results. He points out that most cancers of the colon fall into the lower grades where metastases are slower, lymph node and hepatic involvement correspondingly lower, and in consequence, the result more favorable following successful removal.

TABLE III

Operative Results in Cancer of the Left Colon (Rankin)

	Grade 1	*Grade 2*	*Grade 3*	*Grade 4*
Incidence	13%	67%	16%	4%
Five year cures	63%	51%	30%	18%

Our own experience with carcinoma of the sigmoid prior to five years ago is limited to twenty-one cases.

Five patients, or 31.2 per cent, are living over five years, as follows: thirteen, ten, nine, eight and six years. Two of these five, or 40 per cent, had lymph node involvement.

TABLE IV

Operative Experience with Carcinoma of the Sigmoid (Eggers)

	Number	*Percentage*
Total cases	21	
Inoperable	5	23.7%
Operable	16	76.3%
Five year survivors	5*	31.2%

* Two of these five, or 40 per cent, had lymph node involvement.

Cancer of the Rectum and Rectosigmoid

Cancer of this region presents diagnostic and therapeutic problems quite different from those of the colon. While the lesions originating in the rectum may reach a considerable size before symptoms manifest themselves, those beginning higher up, at the rectosigmoid junction, may give rise to obstruction early. Blood in the stool or clinging to the outside of the stool is a common finding, and should insure a most careful examination with the finger and proctoscope. Too often such bleeding is attributed to the presence of hemorrhoids, and not infrequently operation for this condition has been undertaken only to find later that a carcinoma was the underlying cause. Associated with blood in the stool there may be a feeling of discomfort and pressure, as well as a change in the bowel habit, consisting of increasing constipation, perhaps alternating with diarrhea. At times the patients mention explosive movements of gas and thin feces which are due to the collection of fluid intestinal contents above the obstruction until the pressure reaches such a point that they are forced through. Tenesmus and pain may be present, but are often an indication of a more advanced lesion which has become fixed and exerts pressure. Blood in the stool, associated with change in the bowel habit, and fullness or pressure in the rectum should always call for careful investigation. A digital examination must never be neglected, and reveals the size and exact position of any tumor situated in the lower colon. Even the higher lesions can usually be palpated. One may have the patient return for a re-examination after the bowels have been prepared with a cleansing enema. With the patient lying on the side, or in the knee chest position, or in a squatting position, the examining finger can usually reach the growth when the patient is told to bear down. A biopsy may at times be performed without difficulty, but if the tumor is not readily accessible, it should be deferred until after admission to a hospital. In case the suspected growth is not palpable a proctoscopic examination should be done and will usually show a growth within that portion of gut under consideration. Should the examination be negative a barium clysma is indicated, using the technique described under sigmoid lesions.

Theoretically considered carcinoma of the lower segments of the bowel should be diagnosed early because of their symptoms and easy accessibility. Unfortunately that is not the case. For those tumors sit-

uated at the rectosigmoid junction an alibi may sometimes be advanced, in that the tumor has an unfortunate location for diagnosis. It is just too low to be palpable from above and too high to be felt from below. The x-ray may be negative because of an overlapping loop. The employment of oblique x-rays and the more frequent use of the proctoscope should overcome these difficulties. For failure to diagnose tumors situated low, no alibi exists.

In contemplating treatment one has to consider what one wants to accomplish, namely extirpation of the growth together with the lymph nodes draining that area. This latter is essential because almost half of the patients have lymph node involvement at the time they come under observation. To do a palliative operation would be to exclude all these from any consideration of attempted cure. Radium is advocated by some radiologists for tumors situated low, and good results are claimed. Nevertheless the curative value of radium is not well established and is limited to the primary tumor. Electrocoagulation which has recently been mentioned as a method of treatment probably also has a limited usefulness in readily accessible tumors. Great care is required to prevent perforation into an organ or into the peritoneum. Good results have been reported and it may be well to keep it in mind as a method of treatment in selected cases. The greatest objection to it as an attempt at cure is the fact that the lymph nodes are not removed. It would therefore seem to have its greatest field of usefulness in tumors which have remained localized, and as a palliative measure.

Radical operative removal offers the best chance for cure. Several methods of approach and their modifications are available. Surgeons differ somewhat concerning the best method of procedure, whether to attack by the perineal route with or without a preliminary colostomy, or to perform a radical abdominoperineal resection in one or two stages. Less extensive procedures, such as local excision or resection of the rectum with preservation of the sphincter, find application only rarely in well selected cases. There is no doubt that in tumors situated low, a perineal operation may be carried out with sufficient mobilization of the gut to permit resection of the tumor bearing area and suture of the stump to the skin, leaving the new anus in its normal position, without the necessity of a colostomy. There is of course no sphincteric action, but a certain amount of control develops eventually with the aid of the levator muscles and contraction of the opening. Even growths situated

higher may be safely removed from below after a preliminary colostomy which remains permanently. From the standpoint of cancer surgery, however, which aims to remove the primary tumor together with the lymphatic drainage area, there is no question that the abdominoperineal operation is the preferable one. It is readily understandable, therefore, that at the present time surgeons generally are leaning towards the latter procedure.

One of the most important steps in the successful treatment of cancer of the rectum and rectosigmoid is preoperative care consisting of decompression of the bowel, administration of fluids, transfusion, attention to the heart and kidneys. Operation should be delayed until the patient has been rehabilitated, especially if obstructive symptoms have been present. In such a case division of the abdominoperineal operation into two stages, the first one consisting of a colostomy, is advisable.

With proper preoperative care the operability may be extended, operative mortality reduced and good permanent results obtained. In order to judge reported results one has to know the percentage of operability, as it is easy to have a high percentage of five year results with carefully selected cases.

TABLE V

Carcinoma of Rectum and Rectosigmoid (Eggers)

Total Cases	24
Inoperable	8 or 33.3%
Operable	16 or 66.6%
Mortality	2 or 12.5%
Five Year survivors	5 or 31.2%
Still Living (Six, seven, ten and thirteen years)	4 or 25 %

With an operability of 66.6 per cent and a mortality of 12.5 per cent, we have survivors of five years; and longer, of 31.2 per cent.

Rankin, with an operability of 76 per cent has 34 per cent five year survivors.

TABLE VI

Carcinoma of Rectum and Rectosigmoid (Rankin)

Total Cases	300
Operability	76%
Five Year Survivors	34%

Rankin reports Miles with an operability of 30 per cent and 79 per cent five year survivors, while Jones with a higher operability had 50 per cent five year cures.

Such results can be obtained only in carefully selected cases. With the types of patients presenting themselves to us we feel that we cannot refuse to operate upon all but 30 per cent, and our operability has therefore been extended to include more than twice that number. To obtain good results in such cases should be our aim, and we feel that it is possible by proper preoperative care, and selection of that type of operation which the patient is able to stand and which gives greatest promise of restoration to health. We believe that in tumors situated at a high level, an abdominoperineal operation, performed in one or two stages, has definite advantages because it offers better control of the blood supply, and is therefore less shocking than a perineal operation. In addition to that it gives greater assurance of going well beyond the growth as well as including the involved lymph nodes.

The problems in treatment are well understood and have been largely mastered. The greatest need at present is early diagnosis. The thoughts we would like to leave with you are that cancer in its early stages is curable; cancer in a more advanced stage may still be curable; and that every patient with a positive diagnosis of carcinoma of the gastrointestinal tract is entitled to an exploratory operation, if his general condition permits.